OVERNIGHT CONCRETE

THE ATLAS LUMNITE CEMENT CO

United States Steel USS Corporation Subsidiary

LUMNITE

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LUMNITE

for

Overnight Concrete

The Atlas Lumnite Cement Company

United States Steel Corporation Subsidiary

Chrysler Building, New York • 208 South LaSalle Street, Chicago

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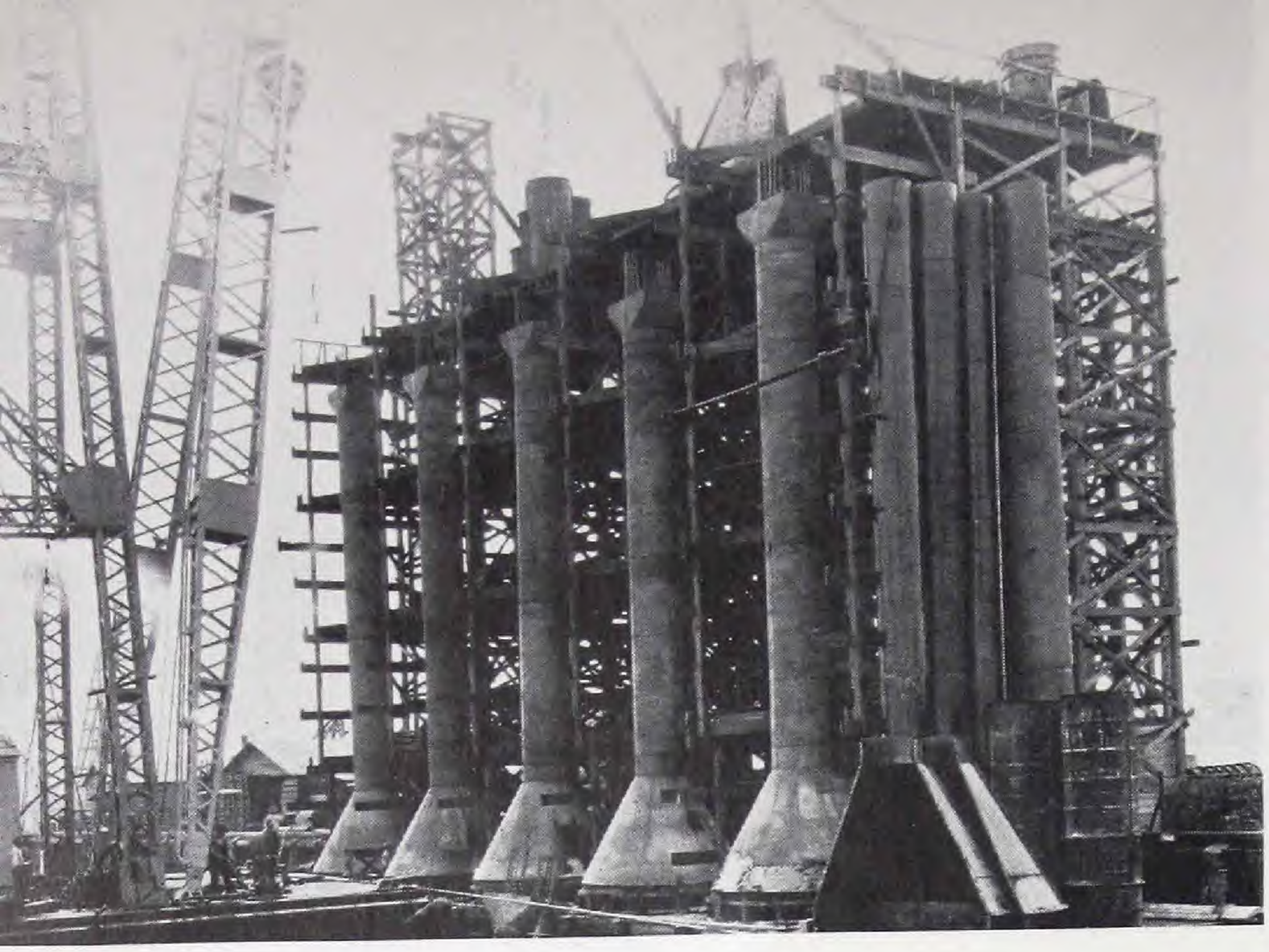


United States Navy Pier, Puget Sound Navy Yard, Bremerton, Wash. 50 ton cylinders precast and ready to place after 24 hours. 240 of these cylinders required about 9000 barrels of LUMNITE.

Materials for Overnight Concrete

Aggregates

For structural concrete in ordinary service the same aggregates may be used as with portland cement. Clean, hard sand, gravel and crushed stone are suitable provided that they are well graded from fine to coarse as required for good portland cement concrete. Light-weight aggregates, such as Haydite and processed slags may be used.

Admixtures

Other cements, lime, anti-freezing compounds, accelerating admixtures and soluble compounds in general should not be mixed with LUMNITE. The mixer, wheelbarrows and other tools should be clean and free from other cements, lime or soluble materials. Contamination by such materials may affect the setting and hardening, resulting in concrete which is unworkable or which fails to harden after placing.

Most mineral pigments used for coloring concrete can be used with LUMNITE. If in doubt, trial mixes should be made with the coloring materials to ascertain their effect on the setting and hardening time.

Mixing Water

Use the least amount of water possible. Excess mixing water is harmful. If a workable mix cannot be obtained without excess water, plasticity can generally be improved by increasing the quantity of sand or decreasing the quantity of coarse aggregate in the mix.

For concrete do not use more than 7 gallons of water per sack of LUMNITE, for mortar not more than 5 gallons of water per sack of LUMNITE, including the moisture in the aggregate in these quantities in each case. Use less wherever possible. Wash water used for cleaning mixer should not be included in the mixing water.

Effect of Quantity of Mixing Water on Compressive Strength
1:2:4 LUMNITE Concrete

Gal. Water per Bag LUMNITE	Compressive Strength at 24 hours
5.26	5253 psi
6.00	4466
7.53	3258
9.41	1809

Use Least Possible Mixing Water

The approximate quantity of moisture carried by average aggregates may be estimated from the following table. An accurate determination for the aggregates on the job should be made when possible.

Very wet sand	¾ to 1 gal. per cu. ft.
Moderately wet sand	about ½ gal. per cu. ft.
Moist sand	about ¼ gal. per cu. ft.
Moist gravel or crushed rock	about ¼ gal. per cu. ft.

Measuring Materials

All materials, including the water, should be accurately measured. Use a cubic-foot box or other container of known capacity to measure the aggregate. One bag of LUMNITE = 94 pounds or one cubic foot or seven and one-half gallons.

Mixing Time

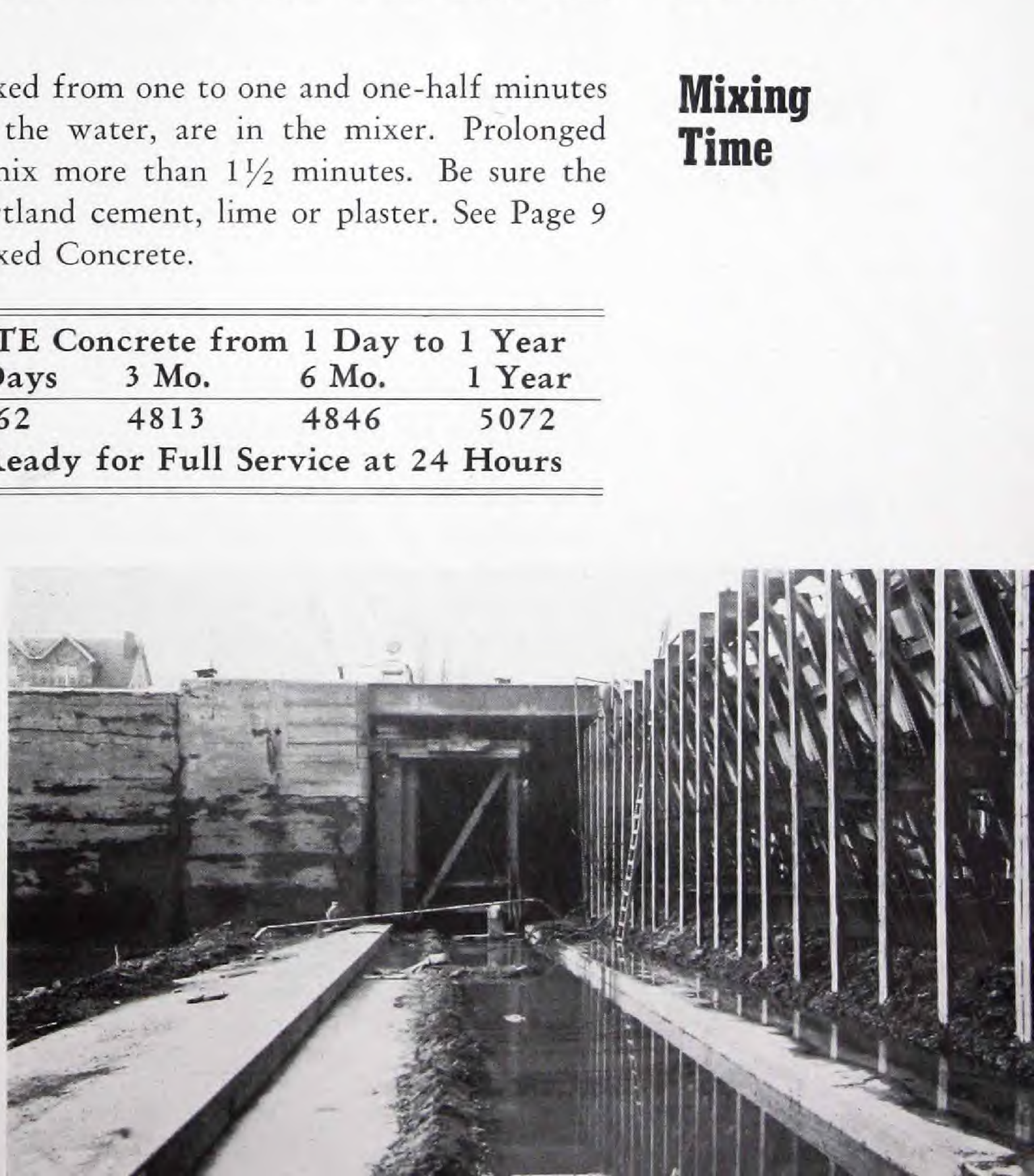
Batches should be machine mixed from one to one and one-half minutes after all materials, including the water, are in the mixer. Prolonged mixing is harmful. Do not mix more than 1½ minutes. Be sure the mixer is clean and free of portland cement, lime or plaster. See Page 9 for suggestions on Transit-Mixed Concrete.

A typical 1:2:4 LUMNITE Concrete from 1 Day to 1 Year

1 Day	7 Days	28 Days	3 Mo.	6 Mo.	1 Year
3441 psi	4391	4462	4813	4846	5072

LUMNITE Concrete is Ready for Full Service at 24 Hours

United States Engineer Office, Corps of Engineers, U. S. Army, specified LUMNITE Concrete for gate tracks on Ohio River Locks, after several years' experience with LUMNITE in similar service.



Methods for Making Overnight Concrete

Proportions of Mix

Concrete made of 1 part LUMNITE, approximately 2 parts sand and 4 parts coarse aggregate is satisfactory for most structural purposes. Proportion of fine and coarse aggregate should be adjusted to give greatest workability. Leaner mixes should be avoided as they may require an excessive amount of mixing water. Richer mixes are usually unnecessary and uneconomical. They should be used only for concrete of small dimensions. For floor mixes see the paragraph on proportions under the heading "LUMNITE Concrete Floors" on Page 10.

Mortars made of 1 part LUMNITE and 2½ parts sand meet most of the ordinary requirements of construction. Richer mixes should not be used except in very thin sections.

Curing

Proper curing of LUMNITE concrete is essential. The curing of LUMNITE concrete differs from the curing of portland cement concrete because of the rapidity of hardening of LUMNITE. Concrete made with LUMNITE *must be cured within 24 hours after mixing* whereas curing of portland cement concrete is continued for several days.

Curing is accomplished by spraying the surface of the concrete with water. No other method is equally effective. Do not cure by flooding the surface, or by covering with wet burlap, sawdust, sand or other materials. Steam curing should not be used.

Time of Curing

Under average conditions, curing water will be required about 6 hours after mixing. In warm, dry weather it may be required before 6 hours and in cold, damp weather as late as 10 or 12 hours. Curing water applied too soon will lower the surface strength of concrete.

The time for first application of curing water may be determined by rubbing the surface with a moistened finger. IF THE FINGER IS CLEAN AFTER THE RUBBING, SPRINKLING SHOULD START. IF THE FINGER IS SOILED BY THE TEST, SPRINKLING SHOULD BE WITHHELD.

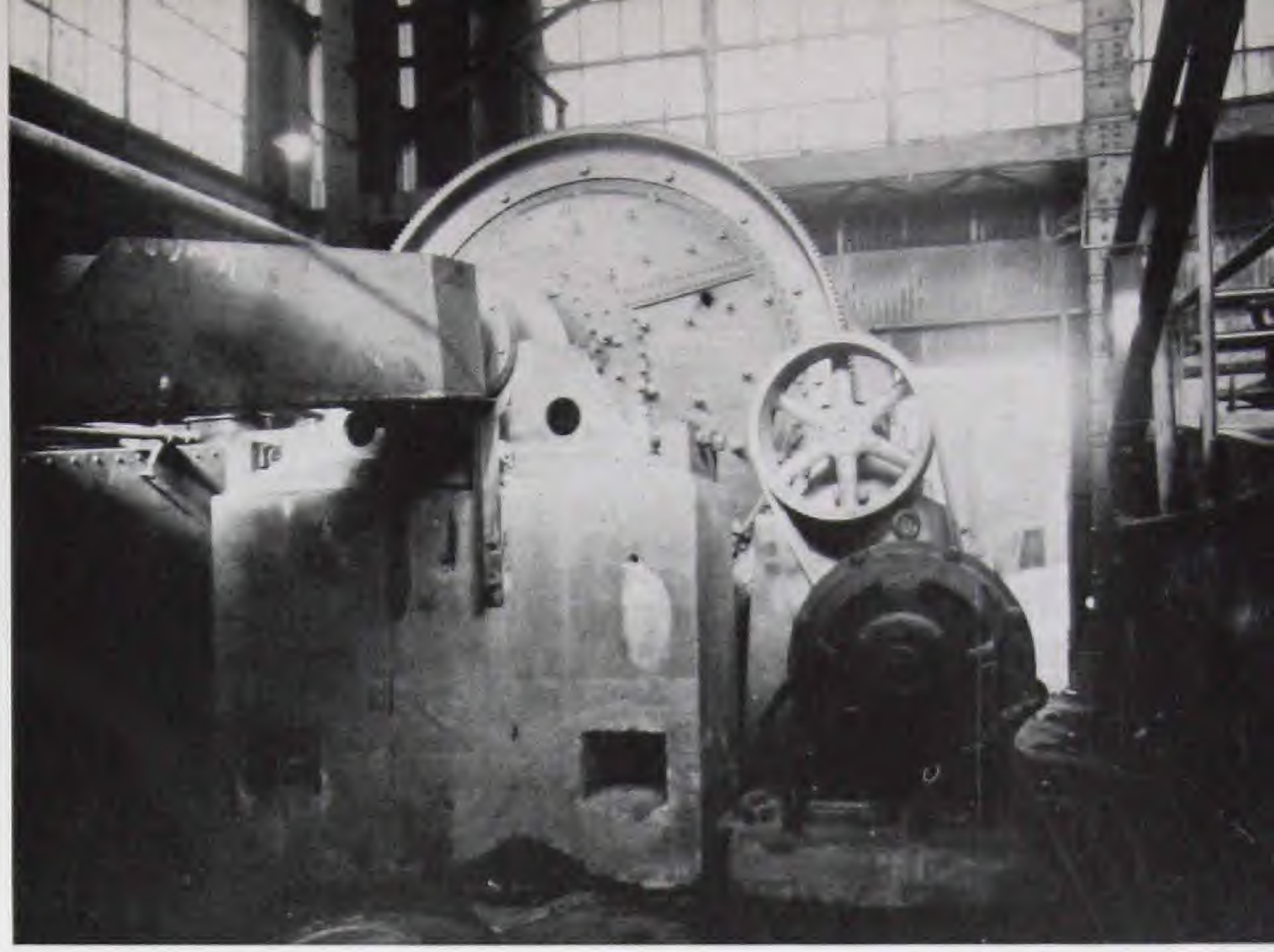
Mass Concrete

The rapid hardening of LUMNITE is accompanied by the generation of appreciable heat. In large masses it is desirable that provision be made for the dissipation of this heat. This may be accomplished in several ways.

The concrete may be deposited in successive layers no more than 15 inches thick, allowing 24 hours between the pouring of the layers. Or, provision may be made for cooling the interior of the mass during the hardening of the concrete. Another means of achieving the same end is to place plumb stones in the concrete as it is poured. These large stones take up the heat of hydration and thus reduce the internal temperature of the concrete. The resulting concrete is cyclopean concrete which has long been used for massive work. Cyclopean concrete is decidedly economical as the volume of mixed concrete required for the structure may be appreciably reduced.

A RUSH JOB ON A COLD WEEK-END
The heavy foundation for this large ball mill had to be placed with least possible delay. LUMNITE concrete was used because:

1. **LUMNITE concrete is stronger than any other kind of concrete at 24 hours.**
2. **LUMNITE concrete can be placed in freezing weather with minimum protection and without artificial heat.**



Placing of the LUMNITE concrete on this job was started at 11 A.M. Sunda At 10 A.M. Monday, curing was completed, the foundation was ready fo mounting the machinery, which was then grouted in place with LUMNIT

Overnight Concrete in Cold Weather

Self-generated warmth of LUMNITE makes Overnight Concrete available even in freezing weather. Costly protection and heating are not needed. Only sufficient heat to keep the concrete above freezing temperature is required. Thin sections exposed to cold wind will lose heat rapidly and therefore require more protection than larger masses.

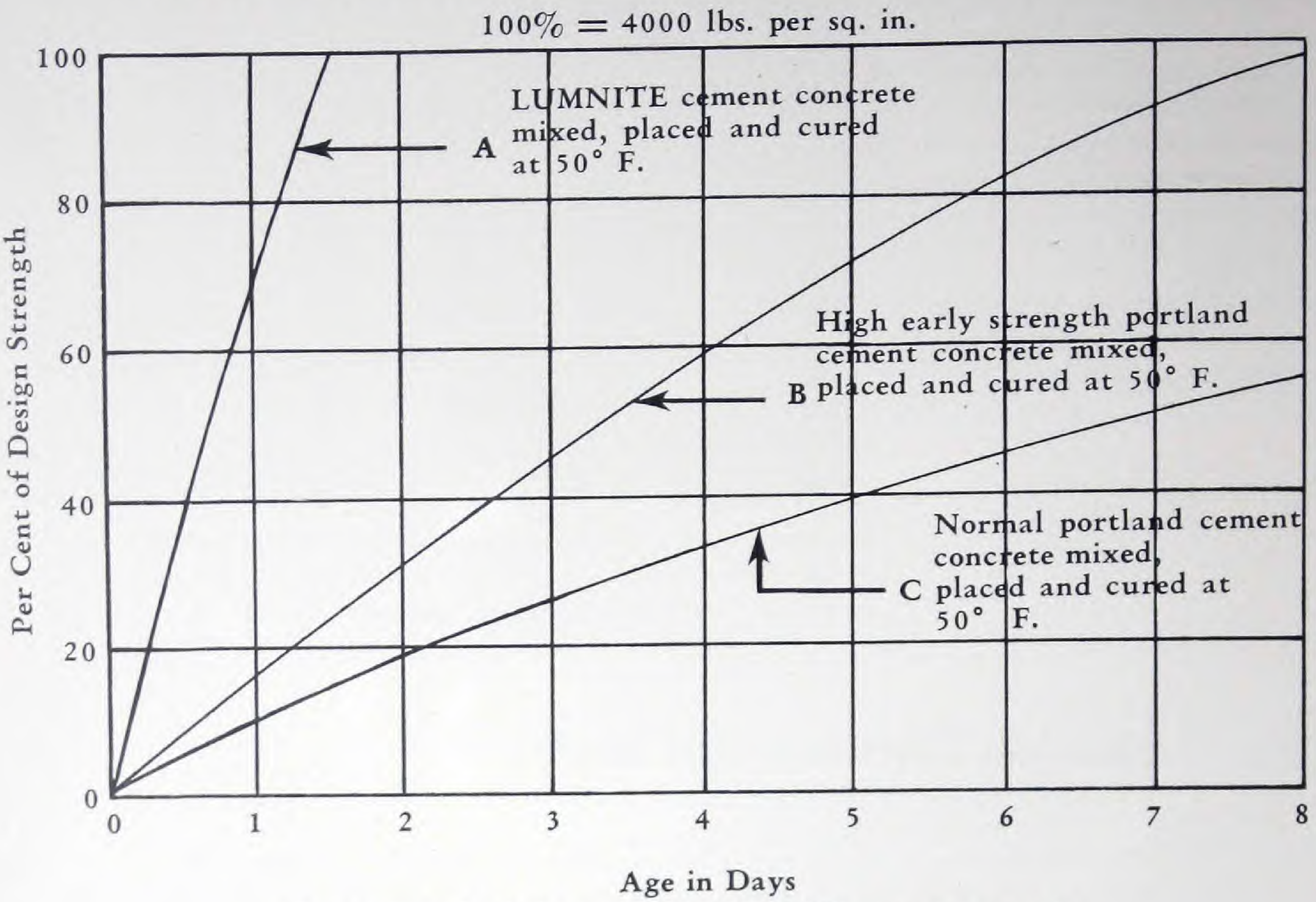
The aggregate should be free from frost. Best results are obtained if the concrete is at a temperature between 50° F. and 70° F. when it leaves the mixer. The concrete should be kept at or near this temperature range at least until it has set and begun to harden.

The concrete should not be heated above 70° F. and heat should not be used to hasten the hardening action. Accelerators and "anti-freeze" admixtures must not be used with LUMNITE. The least amount of mixing water that will produce a workable mix should be used.

Curing water is necessary in cold weather only if the concrete surfaces appear to dry out during the first 24 hours.

Rush construction and maintenance jobs can be done overnight with LUMNITE — regardless of weather.

Cold Weather Concrete



Comparison of gain in strength of LUMNITE concrete, concrete made with high-early-strength portland cement and normal portland cement, mixed, placed and cured at 50° F. Designed strength of all concretes was 4000 psi.

No other American-made cement will produce concrete of the same strength as LUMNITE in 24 hours — under any weather conditions.

Overnight Concrete in Hot Weather

Heat accelerates the hardening of LUMNITE. In hot weather the atmospheric temperature may hasten the hardening of the concrete too much, causing quick set and lowered strengths. It is therefore essential for best results that the LUMNITE, aggregates and freshly placed concrete be protected from the direct rays of the sun.

Sprinkling of the aggregates will lower their temperature. Forms should be stripped as soon as possible. Exposed surfaces of concrete should be cured by sprinkling freely with water. Frequent sprinkling lowers the temperature of the concrete.

Transit-Mixed Concrete

Because of the difficulty in removing partially hardened portland cement concrete from transit mixers there is danger of contamination of LUMNITE concrete with small quantities of portland cement. When LUMNITE concrete is prepared in transit mixers the following precautions should be observed.

Cleaning Equipment

Truck mixers should be thoroughly cleaned to remove all portland cement, and any other foreign material. Portland cement mixed with LUMNITE will cause quicker setting—in certain proportions the mixture will be flash-setting. Absolute cleanliness of equipment is very important. The flushing water, used to clean out the mixers, should be discarded, and should NOT be used as part of the mixing water for the next batch.

Mixing

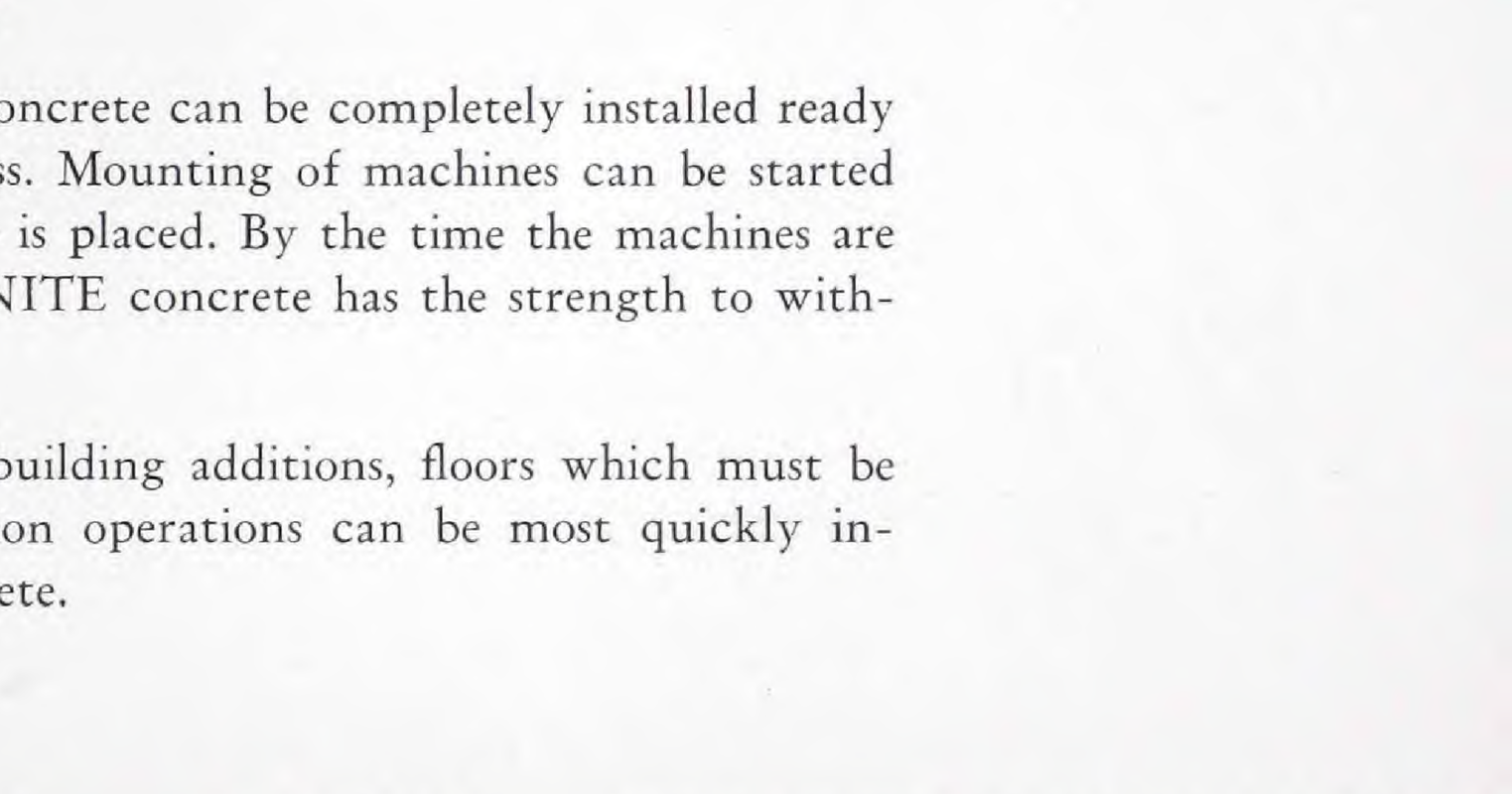
Prolonged mixing (more than 1½ minutes) may cause the LUMNITE to set too fast. *It should not be mixed in transit.* Transport to job and begin mixing just prior to dumping the concrete.

Industrial Maintenance

Machine bases of LUMNITE concrete can be completely installed ready for full load in 24 hours or less. Mounting of machines can be started a few hours after the concrete is placed. By the time the machines are ready for operation the LUMNITE concrete has the strength to withstand load and vibration.

Footings to support steel for building additions, floors which must be in place for essential production operations can be most quickly installed with LUMNITE concrete.

Machine Foundations of LUMNITE Concrete Ready for Full Load in 24 hours.



Lumnite Concrete Floors

Floors and floor toppings of LUMNITE concrete are ready for use the day after placing—even when subject to heavy loads. Week-end maintenance jobs are quickly completed with LUMNITE.

(For information on floors exposed to corrosive conditions see the booklet, "LUMNITE for Corrosion-Resistant Concrete.")

One-Course Floors

Suggestions for materials and methods for making LUMNITE Overnight Concrete, given on the preceding pages, should be followed. Details of curing and finishing are the same as described for LUMNITE Top Courses on the following pages.

The proportions of mix generally used for monolithic LUMNITE concrete floors are: 1 bag LUMNITE, 2 cubic feet sand, 3 to 3½ cubic feet coarse aggregate. The least amount of mixing water which will give a stiff but workable concrete should be used.

Lumnite Top Courses for Concrete Floors

Base Slab

Old concrete floors can be resurfaced with a LUMNITE top course. LUMNITE makes a tough, wear-resistant surface, available in minimum time. The LUMNITE topping can be bonded securely to an old portland cement concrete slab.

A LUMNITE topping may be placed on an unhardened, freshly placed LUMNITE base, but should not be placed on an unhardened base of portland cement concrete. When LUMNITE is to be used for the top course on a new portland cement concrete slab the portland cement slab should be cured for several days before the LUMNITE topping is placed.

Placing

In order to obtain a satisfactory bond between the topping and old concrete it is important to remove entirely the surface of the old concrete so as to expose a clean, dust-free, hard surface. The thickness of the topping on an old or hardened concrete base should be at least one and one-half inches with full thickness at the edge. A feather edge must not be allowed.

A LUMNITE floor carrying heavy loads in a carpet factory. Entire floor was placed on several week-ends — each new section ready for traffic Monday morning.

The base should be moistened until it will not readily absorb any more water. It is common practice to apply LUMNITE grout on the base slab immediately before the top course is placed. Some contractors use a neat grout of LUMNITE and water. Others prefer a 1:1 or 1:2 mix of LUMNITE, sand and water. The grout should be thoroughly broomed and distributed over the surface. (If this treatment of the surface is done too far ahead of the placing of the topping, the grout will dry out and a satisfactory bond will not be obtained.) The mortar topping should then be spaded or worked into a homogeneous, dense mass, free from pockets.

Materials and Proportions

Clean, hard, well-graded aggregates are necessary for successful results. The following proportions are generally used:

Coarse sand (graded from dust to $\frac{3}{8}''$) — 1 part cement to 3 parts sand.

Medium sand (graded from dust to $\frac{1}{4}''$) — 1 part cement to $2\frac{1}{2}$ parts sand.

Fine sand (graded from dust to $\frac{1}{8}''$) — 1 part cement to 2 parts sand. When fine sands must be used in mortar toppings, it is suggested that dust-free stone chips or pea gravel be added to the mix. Such mixes have been used in the proportions of 1:1:2, 1:1$\frac{1}{2}$:2, 1:2:1, 1:2:2, depending on the size and character of the sand and coarse material.

NOTE: All of the foregoing proportions allow for average bulking of the sands.

Mixing Water

Add least quantity of water to give a stiff but workable mortar. The total water in the mix, including moisture in aggregates, should not exceed 5 gallons per bag of LUMNITE. With well-proportioned aggregates or when a power-float is employed for finishing, less water may be used.

Finishing

Screed the mortar with an accompanying tamping and criss-cross movement to insure maximum compacting and uniformity of surface. After screeding, use the wood float a minimum number of strokes. In many cases a wood float finish is all that is desired. For smoother surfaces wood floating is followed by steel trowelling. When trowelling is done too soon water is drawn to the surface, causing dusty surfaces that are weak and rapidly wear away under traffic.

Wait after screeding and floating until the surface becomes somewhat dull in appearance before trowelling. In warm, dry weather trowelling should start sooner than in cool, damp weather. Under average conditions trowelling is done in from two to four hours after mixing. Some contractors have stated that LUMNITE toppings require less trowelling than portland cement floors.

LUMNITE hardens very rapidly after the initial or first set. This necessitates rapid finishing of each section of the floor after it has begun to set. LUMNITE concrete cannot be retempered or trowelled after it has obtained its final set.

When free water rises to the surface it may be removed by belting or wiping the surface with a piece of dry burlap or other absorbent material. "Dryer mixtures" of cement or cement and sand generally cause surface scaling.

Power Float: A power float is often employed for finishing LUMNITE concrete floors. Excellent results can be obtained because more coarse aggregate and less mixing water can be used.

Curing

LUMNITE concrete floor surfaces should be cured by sprinkling as described in the general suggestions for curing LUMNITE concrete on Page 15.

In large areas some portions of the surface will be ready for curing before others. Care should be taken to sprinkle with water only those areas that are hard enough to receive curing water. Curing water should be applied sparingly at first. Do not cure by ponding the surface or by covering with wet sawdust, burlap or other coverings.

Special Uses of Lumnite

Grouting Leaks

LUMNITE grout is used for sealing rock seams and fissures or wherever pumped grout is desired. Its quick-hardening properties are highly advantageous in such work around dams, mines and tunnels. The resistance of the grout to the attack of corrosive ground waters is often an important reason for the use of LUMNITE in this manner.

Industrial Grouting

LUMNITE grout for setting bed plates of heavy machinery and equipment has the high 24-hour strength characteristic of all LUMNITE mortars. One day after placing, the grout is ready for full service.

Best results will be had and the least cement used if a relatively dry mortar composed of 1 part LUMNITE and 2½ parts sand is used. Only sufficient mixing water should be added so the mortar can be packed under the bed plate. All exposed surfaces should be sprinkled as soon as the grout has set—usually in about 6 hours. The mortar should be kept moist for the next 10 to 14 hours.

Quick-Setting Gunite Mixtures

Certain materials added to LUMNITE greatly accelerate the set, frequently causing flash-set. This is true when portland cement is mixed with LUMNITE. Such mixtures should not be used for ordinary construction work, due to the difficulty in controlling the setting time and the fact that the lime content of the concrete is increased. When placed with a cement gun, however, LUMNITE-portland mixtures may solve difficult construction problems.

In the cement gun, the water joints the cement at the nozzle of the gun. Flash-setting mixtures may be used as the gunite is in place before setting occurs. This method is convenient for meeting special conditions, such as shutting off water, sealing caissons, stopping seepage in rock seams and placing bulkheads to seal off mine fires.

Railroad tunnel linings in which such quick-setting mixtures have been placed with a cement gun have been in service over 15 years. LUMNITE-Gunite linings are suggested for the repair of old concrete linings and for new construction. The setting time of the mixtures can be adjusted to suit conditions, so that wet and leaking tunnel walls usually can be sealed without making other provision for the water than the application of the gunite coat.

Equal parts of LUMNITE and portland are commonly used. The exact proportion of the cement mixture to give the desired time of set must be determined by trial batches with the portland cement to be used on the job. Different portland cements will give different results. The portland cement should be thoroughly mixed dry with the LUMNITE until a uniform color is obtained. The two or three parts of sand used with the cement mixture should be very dry.

The water should be at a temperature between 70° F. and 100° F. Cooler water causes slower setting and slower hardening. The nozzle of the cement gun should be equipped with a water ring having not less than 16 holes.

The strength of the LUMNITE-portland mortars will be less at 24 hours than that of an all-LUMNITE mortar. For maximum 24-hour strength LUMNITE should be used without portland cement or other admixture.

SUMMARY OF SUGGESTIONS FOR USING LUMNITE

Proportions

Mortar made of 1 part LUMNITE and 2½ parts sand meets most ordinary construction requirements. Richer mortar mixes should not be used except in very thin sections.

Concrete made of 1 part LUMNITE with approximately 2 parts sand and 4 parts stone (or gravel) is satisfactory for most purposes. Leaner concrete mixes frequently require too much mixing water and should be avoided. Richer concrete mixes are usually unnecessary and uneconomical. They should only be used for concrete of small dimensions.

Mixing Water

Use Least Amount Possible

Concrete made with 5 gallons of mixing water per bag of LUMNITE will be more than twice as strong and more durable than concrete made with 10 gallons.

For mortar, do not use more than 5 gallons of water and for concrete no more than 7 gallons per sack of cement, including the moisture in the aggregates.

Proper Curing Important

Curing water should be applied by sprinkling or spraying. Flooding the surface with curing water, especially at the start of curing, should be avoided. Do not cure by wet coverings, such as burlap, sawdust, or sand as this reduces surface strength and causes dusting.

In mass concrete, forms should be removed as soon as concrete will support its own weight, to increase the surface area to be cured. Surfaces should be kept wet until concrete is 24 hours old.

Under average conditions curing water will be required about 6 hours after mixing. In warm, dry weather it may be required before 6 hours and in cold damp weather as late as 10 or 12 hours.

Curing water applied too soon will lower the surface strength of concrete.

The time for first application of curing water may be determined by rubbing the surface with a moistened finger.

If the finger is clean after the rubbing, sprinkling should start. If the finger is soiled by the test, sprinkling should be withheld.

The application of curing water is very important when LUMNITE is used in warm weather, in rich mixes, in large masses, and on large exposed surfaces where maximum surface strength is desired, such as floors, sidewalks and pavements.

Steam curing or heating to hasten the hardening of LUMNITE should not be used.

LUMNITE

A Special Cement for Special Purposes

Industry uses LUMNITE for these special purposes:

OVERNIGHT CONCRETE—

Structural concrete ready for full service within 24 hours of placing.

CORROSION-RESISTANT CONCRETE—

Structural concrete for floors, foundations, drains and linings subject to the action of many corrosive solutions and wastes.

REFRACTORY CONCRETE—

Concrete for high-temperature service made with LUMNITE as a binder for refractory aggregates. Used for monolithic construction of industrial furnaces, kilns, and other heating equipment and for precast refractory shapes.

STACK AND CHIMNEY LININGS—

Corrosion-resistant, refractory and insulating linings for steel stacks. Corrosion-resistant mortar for brick chimneys and linings.

FOR INFORMATION ON THESE USES OF LUMNITE WRITE:

The Atlas Lumnite Cement Company

United States Steel Corporation Subsidiary

135 EAST 42nd STREET NEW YORK, N. Y.

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